

C H E M I C A L

D I L U T I O N

S Y S T E M S



**FORCE FLOW**

EXPERIENCE THE BENEFITS OF AUTOMATED ONSITE  
C H E M I C A L   D I L U T I O N

MB2 TECHNOLOGY: MASS BASED + MICRO BATCH

Like buying orange juice and detergents, water treatment chemicals are almost always less expensive to purchase in higher concentrations. Unfortunately, feeding high strength chemicals into process water can create problems for the water treatment operator. These problems may stem from things like extremely low feed rates, chemical off-gassing, ambient temperature conditions, very hard process water and safety or regulatory concerns in handling high strength chemicals.

By combining a microprocessor based controller with an instrument grade load cell, the MERLIN® automatically creates small weight-based batches on demand to achieve dilution ratios of up to 1000:1. With this "Mass Based + Micro Batch" technology, users now have a safe, easy and accurate way of diluting high strength water treatment chemicals onsite.

**MERLIN®**  
DILUTION CONTROLLER

1

NEAT STRENGTH  
PERCENT= 14.2

ENTER NEAT CONCENTRATION

2

DILUTE STRENGTH  
PERCENT= 0.8

ENTER DESIRED DILUTION

3



PRESS START

DILUTE 08/09/02  
USED = 5877 lbs

PURE 08/09/02  
USED = 2275 lbs

DILUTE RATE  
lbs/DAY= 839.62

PURE RATE  
lbs/DAY= 325.74

**INVENTORY CONTROL  
& PROCESS ALARMS:**

By tracking nine different variables such as chemical usage, feed rates and remaining quantities, the MERLIN gives you a full accounting of your chemical feed & dilution process. In addition, by tracking throughput and using timers to track the dilution process, six different process alarms give you early warning of potential problems with your chemical feed system that could otherwise go undetected.

ALARM SLO NEAT  
12:55 09/11/02

ALARM SLO H2O  
12:15 02/21/02

ALARM SLO DUMP  
02:12 03/23/02

ALARM HI LEVEL  
22:17 09/13/02

ALARM HI DALY  
12:12 06/10/02

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**DESIGNED  
WITH THE  
USER  
IN MIND**

**ANY DILUTION  
STRENGTH AT THE  
TOUCH OF A BUTTON:**

The MERLIN gives TOTAL flexibility by allowing you to enter any beginning chemical strength up to 100% and then simply choosing a desired ending strength as low as 0.1%. If your chemical supply strength ever changes or if your metering pump has slowed to a crawl, simply punch in the new chemical strengths and the MERLIN does the rest!

**ON DEMAND DILUTION  
REQUIRES MINIMAL  
SPACE:**

Diluting all of your chemical upon delivery requires a large building, storage tank and secondary containment area that in some cases may not be practical or safe. The MERLIN creates diluted chemical based on demand and therefore requires a fraction of the space.

**HYPOTRAK™ ANALYZER:**

For Sodium Hypochlorite applications, the Hypo-Trak analyzer automatically samples chemical concentration before each and every batch by analyzing the current specific gravity of the chemical. This allows accurate dilution even as the chemical supply strength degrades over time and gives the ability to automatically double check the strength of the chemical delivered by the supplier. No more messy titrations that expose operators to hypo!

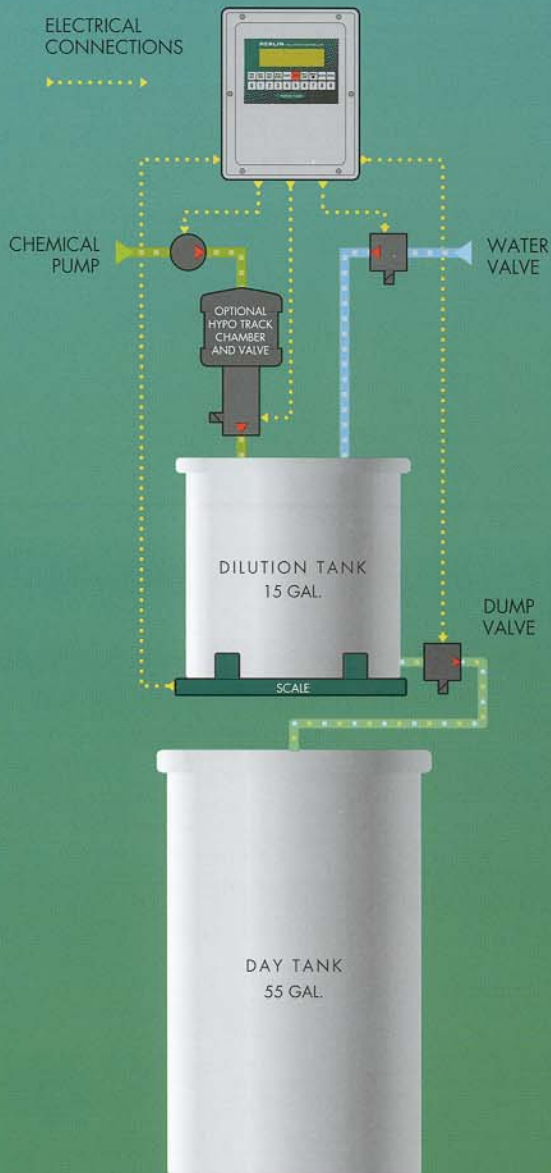
# DILUTION CONTROL SYSTEMS

## PRE-ENGINEERED SYSTEMS:

Since a safe and reliable system is our top priority, all dilution systems are preassembled and factory tested. \*Simply provide water, chemicals and electrical hook-up and your MERLIN Dilution Control System does the rest!

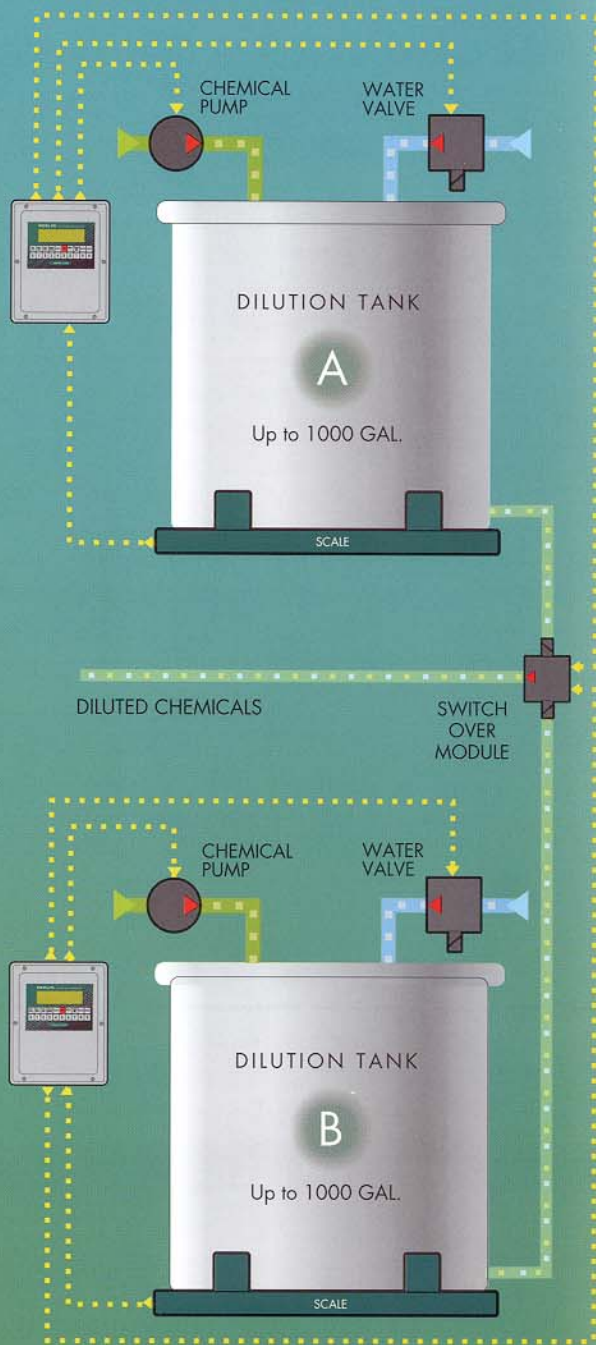
## SMALL PLANTS & WELL SITES

Single controller, single dilution tank with day tank



## LARGE PLANTS REDUNDANT SYSTEMS

Two controllers, two dilution tanks with auto switchover module



DIMENSIONS: CUSTOMER DEPENDANT  
CAPACITY: CUSTOMER DEPENDENT

### \* BULK TANK DILUTION

Dilution Controllers are available for bulk tanks up to 20 ft. tall. The system consists of a single controller, level sensor and overflow switch. No other system components are supplied by Force Flow.

## REDUCED MAINTENANCE AND CHEMICAL COSTS

### BUY CHEMICALS, NOT WATER:

Chemicals are almost always cheaper to purchase in high concentrations. Instead of having your chemical supplier sell you low strength chemicals that are mostly water, blend your own concentration on site!! A Merlin dilution control system can pay for itself quickly in chemical cost savings alone.

### REDUCE OFF-GASSING AND LEAKAGE:

Sodium hypochlorite and other chemicals off-gas at a much higher rate in high concentrations than they do at low concentrations. Preventing off-gassing by diluting helps eliminate vapor locked metering pumps, exploding ball valves and liquid/gas separation that can cause inconsistent feed. Feeding high strength hypochlorite also exploits weak spots in piping and joints causing leaks, which increases maintenance and operator exposure to chemicals.

### SCALING:

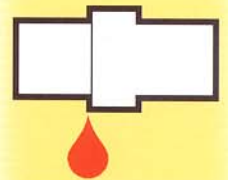
Many chemicals such as Caustic and Sodium Hypochlorite precipitate scaling in the piping and process injection point when fed at high concentrations, ultimately causing maintenance and distribution problems. Lowering the concentration of the source chemical in many cases will alleviate this problem and thus reduce maintenance costs.

### CRYSTALLIZATION:

High strength chemicals like sodium hydroxide (Caustic) begin to crystallize and become very thick at temperatures as high as 55 degrees F making them difficult to feed. Diluting these chemicals allows them to be successfully fed at ambient temperatures down to freezing and reduces the need for heat tracing on piping, valves, etc.



STOP  
WASTING  
MONEY



LEAKAGE



CLOGGED PIPE  
DUE TO  
SCALING

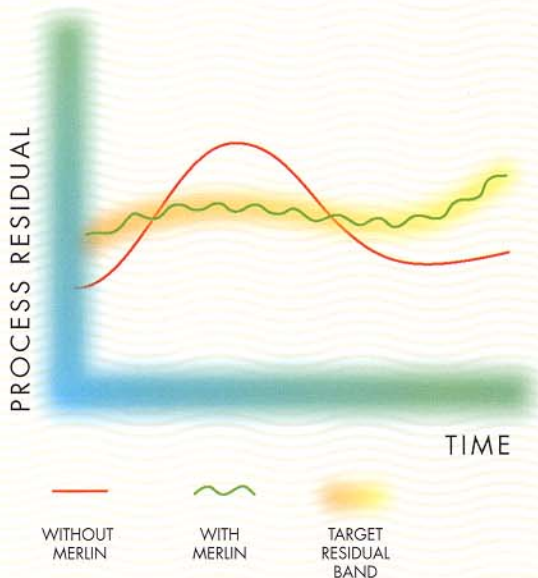
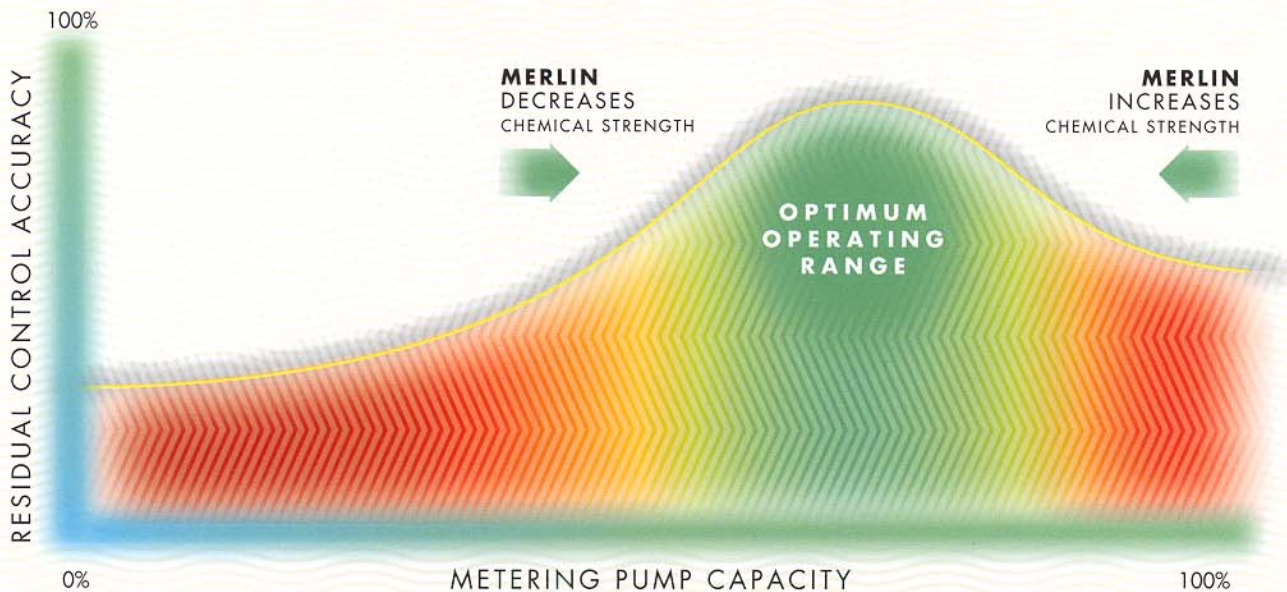
## OPTIMIZE RESIDUAL LOOP CONTROL

### CONTINUOUS REGULATORY COMPLIANCE:

Many states require that metering pumps be operated within a specific zone of the pump turn down range. For instance, The Wisconsin Administrative Code states "metering pumps shall operate at 30-70% of their specified range and a minimum of 12 strokes per minute. If this is not possible, dilution of the chemical will be required." The Utah Administrative Code requires "fluoride solution shall be applied by a pump having a stroke rate not less than 20 strokes per minute." With dilution ratios of up to 1000:1 possible, the Merlin can turn a pump with a 10:1 turndown into a pump with an effective turndown of 10,000:1!!!

### SUPERIOR ACCURACY & REPEATABILITY:

A consistent and reliable chemical strength is paramount to achieving good residual loop control. The fully automated Merlin Dilution Controller produces accurate and consistent chemical strengths by using instrument grade load cells coupled with a microprocessor based controller. Our unique patent pending design allows us to fine tune the dilution process to accuracies greater than 1/10th of 1% for each and every batch.



### HIGH VOLUME / LOW STRENGTH MEANS BETTER CONTROL:

Although many metering pumps have a broad turndown ratio, they are often more accurate and achieve better residual control when operating at the middle to upper end of the range. On demand dilution allows a higher volume/lower strength chemical to be fed. This allows for smaller incremental changes in chemical dosing, enabling tighter residual loop controls (i.e. pH., ORP, streaming current, chlorine) by reducing overshoot.

# S A F E T Y

SODIUM HYPOCHLORITE

14%

## USING LOWER STRENGTH CHEMICALS:

Feeding lower strength chemicals can reduce liability and increase safety. For example, operating and servicing pumps, piping and valves in a sodium hydroxide (caustic) feed system is FAR SAFER when dealing with a 5% solution strength instead of a 49% solution strength. In addition, when sodium hypochlorite is diluted to less than 1%, it is no longer even considered to be a hazardous material by government regulators!



## AUTOMATION & REMOTE MONITORING REDUCES OPERATOR EXPOSURE:

Manually diluting and checking chemical inventories can create hazardous situations and inconsistent results. By automating the dilution process and outputting 4-20mA signals proportional to remaining chemical supplies, the Merlin significantly reduces operator exposure to hazardous chemical spills and splashes.



## REDUNDANT CONTROLS AND ALARMS:

Overflow switches, redundant solenoid valves and six process alarms make the Merlin Dilution System safe and reliable for the most demanding chemical feed applications.

49%

SODIUM HYDROXIDE

30% FLUOSILICIC ACID

# TYPICAL SPECIFICATION FOR CHEMICAL DILUTION SYSTEM



**GENERAL SCOPE:** Dilution system shall use a system of automatically creating small weight based batches on demand to achieve dilution accuracies of up to 1/10th of 1%. Dilution system shall account for the difference of the specific gravity of water and the chemical used. The system shall use a microprocessor based controller to control the opening and closing of a water valve and chemical transfer pump to create the diluted batch. Dilution system shall be totally flexible and capable of diluting any strength of neat chemical solution to as low as a 0.1% chemical solutions. Dilution system shall be preassembled, calibrated and tested prior to delivery. Complete dilution system shall include all necessary piping, valves, plumbing connections, pumps, dilution tanks, weight sensors, controller, and relays necessary for sole source responsibility. Neat chemical shall be delivered in approximately \_\_\_ percent \_\_\_\_\_ (chemical name) and shall be diluted to approximately \_\_\_ percent solution strength. System shall have a maximum capacity of \_\_\_\_\_ gallons/liters of diluted chemical per day.

Optional mixers, water softeners and HypoTrak™ analyzer are available. Specify if required.



**CONTROLLER OPERATION:** Controller keypad shall have the ability of full password protection to restrict unauthorized operation of the dilution system. Start and Stop keys shall initiate and terminate the dilution process. In the fully automatic mode, system shall require the operator to input only neat and dilute chemical strengths and the controller shall calculate required target amounts automatically. If the neat chemical target is exceeded, controller shall automatically adjust the water input in order to maintain the desired dilution strength. For chemicals that give off an exothermic reaction, provisions shall be available to keep heat build up to a minimum. System shall have the capability of complete manual override of the dilution process.

## **ALARMS, OUTPUTS AND INVENTORY MANAGEMENT:**

Controller shall have the capability of fully monitoring the dilution process. All alarms shall be displayed on the controller screen and a normally open, dry contact relay shall be available to indicate the following alarm conditions: Slow neat chemical transfer, slow water transfer, slow dilute chemical feed, maximum daily chemical usage, high dilution tank level and batch strength not available. An alarm log shall keep track of the time and date of the most recent 10 alarm conditions. A 4-20 mA signal shall output the amount of the remaining dilute chemical, remaining neat chemical and whether the system is activated or not. In addition, controller shall report locally all usages, feed rates, and remaining quantities of diluted chemicals. Controller shall also convert these values to a "pure" value in order to evaluate the actual "pure chemical by weight". Dilution system shall be the Merlin Automated Onsite Dilution System as manufactured by Force Flow, 1150-D Burnett Ave, Concord CA 94520 or equal.

**FORCE FLOW**

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PATENT PENDING